

Appl. No. 10/022,224
Amendment dated March 17, 2006
Reply to Office Action of November 17, 2005

LISTING OF CLAIMS:

The present listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A semiconductor device, comprising:

a circuit substrate;

a conductive substrate;

an insulation film disposed on said conductive substrate;

a semiconductor substrate including

a movable portion that may be vibrated in a first direction;

an input electrode disposed on said insulation film so as to face said movable portion through an open space, receiving periodic signal from said circuit substrate, and causing said movable portion to vibrate in said first direction, a first stray capacitor of a first capacitance being induced in said insulating film between said input electrode and said conductive substrate;

an output electrode disposed on said insulation film so as to face said movable portion through an open space, and outputting a vibration signal indicating vibration of said movable portion in said first direction, a second stray capacitor of a second capacitance being induced in said insulating film between said output electrode and said conductive substrate, a noise derived from the periodical signal being added to the vibration signal based on the first and second stray capacitors;

a dummy electrode disposed on said insulation film so as to induce a third stray capacitor of a third capacitance in said insulating film between said dummy electrode and said conductive substrate in a manner that the third capacitance is substantially equal to the second capacitance induced by the output electrode, a dummy signal being generated in said dummy

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electrode from the periodical signal received in said input electrode based on the first and third stray capacitors; and

a noise reducer which reduces the noise of in the vibration signal by using the dummy signal of said dummy electrode.

2. (Original) The semiconductor device as claimed in claim 1, wherein a top surface of said semiconductor substrate has a rectangular shape, and said input electrode and said output electrode are arranged at locations corresponding to different sides of said rectangular shape, respectively.

3. (Previously Presented) The semiconductor device as claimed in claim 41, wherein said shield wire is grounded at said circuit substrate,

4. (Previously Presented) The semiconductor device as claimed in claim 41, wherein said shield wire is arranged adjacent to either of said input electrode or said output electrode.

5. (Cancelled)

6. (Previously Presented) The semiconductor device as claimed in claim 1, wherein said movable portion is movable in a second direction perpendicular to said first direction, said semiconductor device further comprising angular velocity detection means for detecting vibration of said movable portion in said second direction to determine an angular velocity around an axis perpendicular to said first direction and second direction to generate said detection signal.

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7. (Previously Presented) A semiconductor device, comprising:

a circuit substrate;

a conductive substrate;

an insulation film disposed on said conductive substrate;

a semiconductor substrate including

a movable portion capable of vibrating in a first direction and vibrating in a second direction perpendicular to the first direction when an angular velocity around a third direction perpendicular to the first and second directions is applied to the movable portion;

a drive electrode disposed on said insulation film so as to face said movable portion through an open space, receiving a periodic signal from said circuit substrate, and causing said movable portion to vibrate in the first direction, a first stray capacitor of a first capacitance being induced in said insulating film between said drive electrode and said conductive substrate;

a detection electrode which is disposed on said insulation film so as to face said movable portion through an open space, and generates a detection signal indicating vibration of said movable portion in said second direction, a second stray capacitor of a second capacitance being induced in said insulating film between said detection electrode and said conductive substrate, a noise derived from the periodic signal being added to the detection signal based on the first and second stray capacitors;

a monitor electrode which is disposed on said insulation film so as to face said movable portion through an open space, and generates a monitor signal indicating vibration of said movable portion in said first direction, a third stray capacitor of the second capacitance being induced in said insulating film between said monitor electrode and said conductive

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substrate, a noise derived from the periodic signal being added to the monitor signal based on the first and third stray capacitors;

a dummy electrode disposed on said insulation film so as to induce a fourth stray capacitor of a third capacitance in said insulating film between said dummy electrode and said conductive substrate in a manner that the third capacitance is substantially equal to the second capacitance, a dummy signal being generated in said dummy electrode from the periodic signal received in said input electrode based on the first and fourth stray capacitors; and

a noise reducer which reduces the noise of the detection signal or the monitor signal by using the dummy signal of said dummy electrode.

8. (Previously Presented) The semiconductor device as claimed in claim 7, wherein said semiconductor substrate is a rectangular plate, and said drive electrode and a group of said detection and monitor electrodes are arranged at locations corresponding to different sides of said rectangular plate, respectively.

9. (Previously Presented) The semiconductor device as claimed in claim 42, wherein said shield wire is grounded at said circuit substrate.

10. (Currently Amended) The semiconductor device as claimed in claim 42 ~~41~~, wherein said shield wire is arranged adjacent to either of said input ~~drive~~ wire or said output wire.

11. (Currently Amended) The semiconductor device as claimed in claim 42 ~~43~~, wherein said shield wire is arranged adjacent to either of said drive wire or ~~said monitor wire~~ both said detection wire and said monitor wire.

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12-25. (Cancelled)

26. (Currently Amended) The semiconductor device as claimed in claim 1, wherein said movable portion comprises an electrode facing said output electrode to provide a capacitance providing said capacitive variation when said movable portion vibrates in said predetermined direction.

27. (Currently Amended) The semiconductor device as claimed in claim 7, wherein said movable portion comprises an electrode facing said ~~output~~ detection electrode to provide a capacitance providing said capacitive variation when said movable portion vibrates in said ~~predetermined~~ second direction.

28-40. (Cancelled)

41. (Currently Amended) The semiconductor device as claimed in claim 1, further comprising:

an input wire which connects said input electrode and said circuit substrate to supply the periodic signal to said input electrode;

an output wire which connects said output electrode and said ~~circuit substrate~~ external circuit to supply the vibration signal to said ~~substrate~~ circuit substrate; and

a shield wire which is disposed between said input wire and said output wire and is set at a constant potential to provide capacitive shielding between said input wire and said output wire.

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42. (Previously Presented) The semiconductor device as claimed in claim 1, wherein the noise reducer has a subtractor which subtracts a value of the dummy signal generated in the dummy electrode from a value of the vibration signal outputted from the output electrode and outputs a difference signal indicating a difference between the vibration signal and the dummy signal.

43. (Currently Amended) The semiconductor device as claimed in claim 7, further comprising:

a drive wire which connects said drive electrode and said circuit substrate to supply the periodic signal to said drive electrode;

a detection wire which connects said detection electrode and said circuit substrate external circuit to supply the detection signal to said ~~subtractor~~ circuit substrate;

a monitor wire which connects said monitor electrode and said circuit substrate external circuit to supply the monitor signal to said ~~subtractor~~ circuit substrate; and

a shield wire which is disposed between said drive wire and a group of said detection and monitor wires and is set at a constant potential to provide capacitive shielding between said drive wire and the group of said detection and monitor wires.

44. (Previously Presented) The semiconductor device as claimed in claim 7, wherein the noise reducer has a subtractor which subtracts a value of the dummy signal generated in the dummy electrode from a value of the detection or monitor signal outputted from the detection or monitor electrode and outputs a difference signal indicating a difference between the detection or monitor signal and the dummy signal.

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45. (New) The semiconductor device as claimed in claim 7, wherein said movable portion comprises an electrode facing said monitor electrode to provide a capacitance providing said capacitive variation when said movable portion vibrates in said first direction.